Working Papers

FRITZ BREUSS, JEAN TESCHE

Hungary in Transition

A CGE Model Comparison with Austria

44

FRITZ BREUSS, JEAN TESCHE

Hungary in Transition

A CGE Model Comparison with Austria

August 1991

WIFO Working Papers, 1991, (44)

Hungary in Transition

A CGE Model Comparison with Austria

Fritz Breuss
Austrian Institute of Economic Research
P.O. Box 91
A-1103 Vienna, Austria

Jean Tesche
Emory University
Department of Economics
Atlanta, GA 30322, U.S.A.

Abstract

In this paper we have approached the problem of Hungary's transformation from a partially centrally planned to a market oriented economy with a cross-country comparison using 2 CGE models of Hungary, 1977 and 1986 and of Austria (1976). These three models represent a continuum of small open economies and allow a "quasi-dynamic" analysis unsing static CGE models. We examined 2 types of transformational issues: external (trade liberalization, import prices reductions and redirection of foreign trade - "Dutch disease reversal") and internal (decrease in subsidy levels). Overall it is clear that with Hungary's borrowing constraints, liberalization should not be pursued all at once. A change in the tax structure is necessary at the same time. The results for Austria indicate that with a more liberalized trade system and a higher degree of Western integration, the welfare improvements are smaller with increased liberalization, but are also more possible with smaller increases in the current account and government deficits.

This paper has been presented at the Fifth Task Force Meeting on Applied General Equilibrium Modeling, IIASA, Laxenburg, Austria, August 27-29, 1991.

1 Introduction

Austria and Hungary are linked in many ways historically. However, after the Second World War they pursued very different paths economically. Hungary adopted the rigid centrally planned Soviet economic model with state ownership of virtually the entire economy. Hungary was also a member of CMEA, the East-bloc trade group. Even as most of the economy was slowly being reformed after 1968, half of all trade was still conducted within a rigid barter system with other centrally planned economies. With the collapse of the CMEA market, Hungary's re-integration into the world economy and world trading system has become essential.

Austria, on the other hand, remained a market economy with a large state sector (1/4 of industry is state owned). Austria has been a member of EFTA since 1960. Since the free trade agreement between EFTA and EC in 1972 Austria has been reintegrated into the EC market. In July 1989 Austria applied for full membership in the EC. An intermediate step may be the EEA (European Economic Area) which should be in place at the same time as the Single Market in 1993.

A comparison with a market economy of similar size, can shed some light on Hungary's ambitions to transform to a market economy and reintegrate to Western Europe. For this purpose we use 7 sector CGE models of Austria and Hungary to compare the effects of structure on responses to different shocks and economic policies. Policies of particular interest are those which bring both countries more in line with trade liberalization targets of the EC and GATT.

The models are calibrated to 1976 for Austria and 1977 and 1986 for Hungary. 1976 is the latest input-output table available for Austria and 1977 the closest year for Hungary for comparison. Although these are not current models, Austria in 1976 can yield some insights for Hungary as it transforms its economy from central planning with a huge state sector to a market economy with the balance tipped towards private ownership.

There are other ways to approach the transformation process of centrally planned economy into market economies. Macroeconomic aspects are dealt with by, for example, *Lipton and Sachs* (1990) for Poland and *Kornai* (1990) for Hungary. *Calvo and Frenkel* (1991) analyse theoretically the early stages of transformation of centrally planned economies into market economies using a simple dynamic macro model. In particular, they study the consequences of price reform on inflation, fincancial markets and labour markets.

There have also been some attempts to examine the transformation process in former centrally planned economies with CGE models. *Adelman, Berck, and Vujovic* (1991) design a gradual transition to a market economy with a CGE model for Yu-

goslavia. They convert the allocations and targets of a socialist economy (including a distorted price system) into subsidy-and-tax price equivalents in a market economy. *Zalai and Révész* (1991) use a general equilibrium programming model (HUMUS) of the Hungarian economy in order to analyse the problems of the redirection of trade from Ruble into Dollar areas.

Our approach is somewhat different. A single static CGE model of Hungary could not possibly capture the tranformation process - a task which could only be fulfilled with a dynamic/intertemporal model. Instead we ask the question, what are the possible effects of opening up foreign trade and cuts of subsidies in a model which captures rigid elements of a mixed economy (plan and partly market) as was the case in Hungary since the early seventies. A comparison with Austria - a market economy of similar size but higher level of development - can indicate the costs of adjustment the Hungarian economy might face on the road to a fully functioning small open market economy.

Section 2 of the paper contains an overview of the Hungarian and Austrian economies. Section 3 describes the 2 CGE models. Section 4 contains the discussion of the policy simulations and section 5 concludes the paper.

2 Austria and Hungary in Comparison

A recent summary of the general macro and microeconomic features of a centrally planned socialist economy (CPE) can be found in *Calvo and Frenkel* (1991, pp. 268-269). Although Hungary has been pursuing economic reform since 1968, elements of the planned economy remained until recently: Prices did not represent real social costs, incentive systems were absent or counterproductive, losses of unprofitable stateowned enterprises were automatically financed (*Kornai's* so-called "soft budget constraint"), legislation vital for the functioning of markets were not in place, private ownership and property rights were underdeveloped, markets were missing and shortages prevailed (a "supply-constrained economy versus demand-constraints in market economies" as *Kornai* termed it) which lead to "queuing" (a phenomen which was dealt with theoretically by *Lipton and Sachs* (1990), among others). Unemployment was suppressed due to ideological reasons. All in all CPEs were characterized by many kinds of distortions and inefficiencies.

Although Hungary in the last 10 years has been probably one of the least economically distorted socialist countries, one major severe distortion is to be found in the foreign trade sector. Nearly 50% of trade was done with the non-competitive Ruble area (CMEA). This had detrimental effects on the efficiency of production and quality of products. The foreign trade structure is one of the major challenges in redirecting trade from the CMEA to the West.

Table 1

The Austrian Economy, 1976

	Production shares (%)	Net trade/ production ratio (%)	Export/ production ratio (%)	Import/ production ratio (%)	Elasticity of substitution between imports and domestic goods	Degree of protection Tariff rate (%)[a]	Degree of protection ERP (%)[b]
1. Agricultural and food	12,32	−8,12	4,22	12,33	2,00	5,50	7,20
2. Building materials/constr.	7,55	+0,55	0,94	0,40	0,50	1,30	1,00
3. Intermediates	23,01	−9,91	27,20	37,10	0,75	1,70	1,80
4. Machinery	5,82	−22,79	31,19	53,98	0,50	3,30	4,60
5. Light manufacturing	9,99	+2,91	29,35	26,44	0,75	4,40	5,90
6. Material services	28,13	+2,79	5,57	2,78	0,50	0,70	0,20
7. Non-material services	13,18	−0,05	0,26	0,32	0,50	0,60	0,00
Total	100,00	−3,50	13,20	16,70	−−	∅2,50	∅2,96

[a] Effective tariff rate, calculated as the ratio of tariff revenues to import values.

[b] ERP = Effective rate of protection, calculated with the Balassa-Corden (BC) formula.

(see *Devarajan and Lewis*, 1989): $BC_i = \frac{PW_i^M(1+t_i^M)ER - \sum_{j=1}^{n} a_{ji} PW_j^M(1+t_j^M)ER}{PW_i^M ER - \sum_{j=1}^{n} a_{ji} PW_j^M ER}$.

The Hungarian Economy, 1977

	Production shares (%)	Net trade/ production ratio (%)	Export/ production ratio (%)	Import/ production ratio (%)	Elasticity of substitution between imports and domestic goods	Degree of protection Tariff rate (%)[a]	Degree of protection ERP (%)[b]
1. Agricultural and food							
Total	26,69	+4,03	15,46	11,44	––	––	––
Non-Ruble trade	––	+0,19	10,39	10,20	2,00	4,80	2,40
2. Building materials/constr.							
Total	13,37	−0,82	1,88	2,70	––	––	––
Non-Ruble trade	––	−0,57	0,39	0,96	0,50	10,20	9,50
3. Intermediates							
Total	15,15	−25,35	26,27	51,62	––	––	––
Non-Ruble trade	––	−9,50	18,05	27,55	0,75	7,20	5,90
4. Machinery							
Total	12,20	+0,45	39,92	39,47	––	––	––
Non-Ruble trade	––	−6,90	9,45	16,35	0,50	33,20	70,30
5. Light manufacturing							
Total	9,41	+6,58	22,05	15,47	––	––	––
Non-Ruble trade	––	+5,03	10,54	5,51	0,75	10,30	11,70
6. Material services							
Total	13,30	+3,17	6,70	3,53	––	––	––
Non-Ruble trade	––	+1,95	3,20	1,26	0,50	0,00	0,00
7. Non-material services							
Total	9,88	––	––	––	––	––	––
Non-Ruble trade	––	––	––	––	0,50	––	––
Total							
Total	100,00	−1,78	16,19	17,96	––	––	––
Non-Ruble trade	––	−1,58	8,13	9,69	––	⌀10,95	⌀16,63

[a] Effective tariff rate, calculated as the ratio of tariff revenues to import values.

[b] ERP = Effective rate of protection, calculated with the Balassa-Corden (BC) formula.

(see *Devarajan and Lewis*, 1989): $BC_i = \frac{PW_i^M(1+t_i^M)ER - \sum_{j=1}^{n} a_{ji} PW_j^M(1+t_j^M)ER}{PW_i^M ER - \sum_{j=1}^{n} a_{ji} PW_j^M ER}$.

The Hungarian Economy, 1986

	Production shares (%)	Net trade/ production ratio (%)	Export/ production ratio (%)	Import/ production ratio (%)	Elasticity of substitution between imports and domestic goods	Degree of protection Tariff rate (%)[a]	ERP (%)[b]
1. Agricultural and food							
Total	24,15	+7,74	13,03	5,29	––	––	––
Non-Ruble trade	––	+4,27	8,47	4,20	2,00	14,70	22,30
2. Building materials/constr.							
Total	10,22	−0,47	3,21	3,68	––	––	––
Non-Ruble trade	––	+0,32	2,52	2,20	0,50	1,10	−5,00
3. Intermediates							
Total	18,96	−18,26	16,61	34,92	––	––	––
Non-Ruble trade	––	−4,08	10,56	14,64	0,75	4,90	3,70
4. Machinery							
Total	13,79	+7,65	44,58	36,93	––	––	––
Non-Ruble trade	––	−6,07	11,62	17,69	0,50	18,00	33,80
5. Light manufacturing							
Total	8,57	+11,77	20,89	20,28	––	––	––
Non-Ruble trade	––	+8,65	11,44	2,79	0,75	12,00	16,50
6. Material services							
Total	12,89	−0,26	5,81	6,06	––	––	––
Non-Ruble trade	––	+4,15	4,26	0,11	0,50	2,00	0,03
7. Non-material services							
Total	11,42	+0,00	0,00	––	––	––	––
Non-Ruble trade	––	+0,00	0,00	––	0,50	––	––
Total							
Total	100,00	−0,56	15,32	15,88	––	––	––
Non-Ruble trade	––	−0,70	7,44	8,13	––	∅8,78	∅11,89

[a] Effective tariff rate, calculated as the ratio of tariff revenues to import values.

[b] ERP = Effective rate of protection, calculated with the Balassa-Corden (BC) formula.

(see *Devarajan and Lewis*, 1989): $$BC_i = \frac{PW_i^M(1+t_i^M)ER - \sum_{j=1}^{n} a_{ji} PW_j^M(1+t_j^M)ER}{PW_i^M ER - \sum_{j=1}^{n} a_{ji} PW_j^M ER}.$$

Hungary and Austria are of nearly equal size as far as population is concerned. Hungary has 10,4 Million inhabitants, Austria has 7,6 Million. On the other hand, the stage of development differs greatly. Austria's GDP per capita in 1989 amounted to 16,600 US-$ (at current prices and exchange rates), whereas in Hungary this figure was just 2,700 US-$. The Hungarian GDP figures may be underestimated for several reasons: methodological reasons (underrepresentation of the service sector), the desire to keep GDP figures low in order to get preferential status for their exports to Western markets and the lack of accounting for the second economy.

The differences in output structures in Austria and Hungary are apparent in *Tables 1 to 3.* In Hungary, approximately one fourth of production is in agriculture and food, compared to only 12% in Austria. Austria's two largest production sectors are intermediate goods and material services. Hungary's production was more evenly divided among the other sectors. The service sector accounts for 41% in Austria, versus 23-24% in Hungary.

Both Austria and Hungary had the largest import and export to production ratios in 3 sectors: machinery, intermediates and light-manufactures (consumer goods). The trade ratios do not tell the entire story for Hungary, however. By separating non-Ruble (convertible currency trade with the West and the rest of the non-Socialist world) and total ratios, a very different trade structure in the two areas can be seen. In 1977 the agriculture import to production ratios were nearly equal, which means that most agriculture imports came from the West. Intermediate and machinery imports were nearly double for the total, so the amounts were similar from the two areas. The total for consumer goods was 3 times non-Ruble, so relatively more imports were coming from the CMEA. The figures for 1986 are similar except the proportion of light-manufactures from the CMEA was much higher.

There were relatively more agricultural exports to the West than to CMEA. Note that the ratio for machinery is 4 times higher for the total. Although intermediates and machinery had nearly equal shares, there were many more machinery exports to the East. Again the proportions are similar for 1986.

Tariff levels were much higher in Hungary than in Austria[1]. The highest tariff rate in Austria was 6% for agriculture and the highest effective rate of protection (using the Balassa-Cordon formula) was 7%. The highest rate for Hungary in 1977 for Dollar trade[2] was 33% in machinery, but over 10% in construction and light manufactures. (This probably reflects the growing debt problems and the attempt to curtail Dollar area imports). Only in agriculture were tariffs less than in Austria

[1]Tariff rates are the actual tariff revenues divided by the value of imports. 1981 tariff rates were used for the 1977 Hungary model. The data in the statistical yearbook for 1977 was not very reliable.

[2]Note Ruble trade tariffs and subsidies have a different meaning. Domestic prices of Ruble trade were kept constant with tariffs and subsidies varying with changes in world prices. Tariffs and subsidies played no role in influencing trade flows, which were determined in advance centrally.

at 5%. The effective rates of protection were similar to the tariff rates except for machinery where it was 70%.

In 1986 overall tariff levels were much lower in Hungary, although agriculture tariffs increased to 15%. Machinery was still high at 18% and light manufactures slightly higher at 12%. The ERPs differ more from tariff rates in 1986. They are much higher in machinery, but negative in construction (although this is a small part of total trade).

Overall, Austria has less agriculture as a proportion of total production and a strong service sector. Manufacturing is relatively small, except intermediates. Hungary has a strong agriculture sector and, as is typical for socialist countries, an underdeveloped service sector. The trade orientation has large implications as Hungary turns more toward the West. Much of intermediate imports come from the East, specifically the Soviet Union, as well as consumer goods. There was clearly an attempt to switch from Western to Eastern sources of machinery and consumer goods between 1977 and 1986. The large proportion of machinery exports to the less demanding CMEA market also has serious implications. As CMEA trade has dropped rapidly, Hungary needs to export more manufactured goods to the West to pay for the necessarily increasing imports. However, more than 20 years of trying to increase non-ruble manufactured goods exports have not been very successful.

3 The CGE Models of Austria and Hungary

There are several problems in approaching the transformation process of socialist economies with static CGE models. In the transition process the whole economic and political system changes. CGE models capture only the static status quo structure of the economy in one point in time. Financial aspects are excluded in most CGE models, although asset-transfer phenomena involved in the privatization of industry are essential in the process of transition. Additionally, a problem of many CPEs, namely the so-called "liquidity overhang" cannot be captured (*Calvo and Frenkel* (1991) deal with such phenomena). Analyses with static general equilibrium models therefore might underestimate the inflationary potential of the transition.

The first best way to analyse transformation would be to do it in a dynamic framework. A second best solution may be a cross-country comparison. Hence, our comparative approach with three static models (Hungary 1977 and 1986, Austria 1976) of countries with different development stages and market structures is actually a "quasi-dyanamic" analysis of the transition process.

3.1 The Austrian Model

The Austrian CGE model is fairly standard in the developed and developing country model tradition (see *Dervis, De Melo and Robinson*, (1982). The Austrian model is described in *Breuss and Tesche*, (1991)). The detailed model (equations and definitions of variables) is given in the *Appendix.*

Production and Factors of Production

The model includes a Cobb-Douglas production function with 2 factors: labor and capital. Producers are assumed to maximize profits and labor and capital demand are derived from the first order conditions. Total labor and capital supplies are fixed, but both factors are mobile between sectors. Intermediate demand is determined from fixed coefficients and value added reflects both indirect taxes and subsidies (equations 1 to 4 in the Appendix).

Foreign trade

Austria is considered a small country with imports and domestic production imperfect substitutes. The trade sector is modeled in an *Armington* fashion. Consumers maximize their utility over the composite good. Exports and domestic production are also considered imperfect substitutes, but Austria also faces a downward sloping demand for its exports (equations 5 to 13).

Income and savings

These equations reflect Austria's particular tax structure. The government owns a proportion of industry, and so receives part of firm profit (GPROF). Household income includes government transfers, part of enterprise profits and remittances from abroad. Households are taxed directly and enterprises pay wage taxes that include social security taxes. Government revenue comes from the various tax sources and foreign borrowing minus subsidies (equations 14 to 29).

Final Demand

Consumers consume with fixed shares - assuming Cobb Douglas utility functions - and real government spending on goods and services is fixed (equations 30 to 37).

3.2 The Hungarian Model

Although the CGE models of Hungary for 1977 and 1986 caputure features of a planned socialist economy, we nevertheless make the same strong neoclassical as-

sumptions of general equilibrium for most of the economy as in the Austrian model. In assuming market-like reactions of economic agents, the methodology behind the Hungarian model is already ahead of reality!

The Hungarian model equations are similar in the general form of production function and import and export substitution equations. Of course, the Hungarian model has a different sectoral structure, tax system and the rigidities of the partially reformed planned economy (see *Tesche*, (1991)).

Production and Factors of Production

The Hungary model also uses a Cobb-Douglas production function, but it includes a tax that firms payed on existing capital. Producers are assumed to at least move in the direction of profit maximization. Sectoral capital is fixed, so labor is the only mobile factor of production. Labor demand is also derived from the first order conditions, but a wage tax is included. This includes Social Security taxes, but was also intended to limit wage increases.

Foreign Trade

Non-Ruble foreign trade is treated in the same way as trade in Austria, with the same substitution elasticities. However, Ruble trade, approximately one half of the total, is the major rigidity in the Hungarian models. In spite of reform attempts, this part of trade and production remained centrally planned. Ruble area trade flows were bi-laterally balanced and fixed for long periods. Prices have followed world prices with a lag since the mid 1970's. Therefore, Ruble trade flows and the price of ruble imports are fixed in both models. Only Dollar imports are used in the trade aggregation functions. Net Ruble exports are considered a separate part of final demand. Firms must produce ruble exports first and then decide between production for the domestic market or non-ruble exports.

Income and Savings

The differences here mainly reflect the predominance of state ownership (no private enterprise income) and the less developed financial system. Household income consists only of wage income and government transfers. There are no direct foreign remittances to households.

3.3 Common Features in both Country Models

Both CGE models have the same neoclassical theoretical and methodological background. For comparative purposes, the basic elasticities used in the CGE models,

have the same values. Sensitivity analysis - doubling for instance the Armington subsitution elasticity ρ^C - showed that the results are quite robust overall, although in some sectors changes of signs may occur.

Market clearing conditions (equations 37 to 42) for the goods, factor markets as well as for the budget and the foreign trade constraints are the same in principle. In the Hungarian model, however, two market clearing conditions - one for Ruble and one for Dollar trade - have been specified.

Generally we assume that foreign borrowing is constrained for Hungary, and therefore the non-ruble current account balance is held constant. Investment (savings) must then adjust. We also use the "neoclassical closure" rule (i.e., we assumed that real investment is fixed with total savings, including foreign savings, adjusting to finance this level) for the free trade and redirection of trade simulations (*Tables 4 and 5*).

This closure rule is appropriate, if one is interested more in the consequences of trade liberalization for the current account. If, however, one is more interested in the welfare or efficiency aspect of liberalization, another closure rule with a fixed current account is more appropriate. Adjustment then takes place in investment/savings. In both country models we have chosen the nominal exchange rate as numéraire.

4 Policy Simulations

Our policy simulations concentrate on two main topics of transformation - *external* and *internal* adjustment:

Firstly, we study liberalization issues which are vital for Hungary's reorientation of trade from the CMEA towards the West, in particular towards the EC. In this context we look at three different issues: the hypothetical case of a complete elimination of import tariffs, tariff adjustment to EC levels and an overall reduction in the world price of imports to examine the effects of an external shock related to potential EC membership.

A special case - simulated only for Hungary - is the redirection of trade from Ruble to Dollar areas. In a way this can be interpreted as "curing" a type of a "Dutch disease" (or "Ruble disease"). The existence of a market for its manufactured goods, which could not be sold in the West in exchange for "hard" intermediate goods can be viewed as a type of "Dutch disease" with the emphasis on the manufacturing sector at the expense of agriculture. A cutback of trade with the CMEA functions like the reverse of this phenomena. This leads to income cuts from uncompetitive trade and puts pressure on the export industry to restructure.

Secondly, we examine issues of internal transformation. A cut in overall domestic

Table 4

Simulations I:

Free Trade Scenario*

(Investment = fixed)

(Per cent changes compared with benchmark solution)

	Austria (A)	Hungary (B)	Hungary (C)
I. Economy-wide effects			
Domestic goods price	−0,12	−1,30	−1,69
Composite goods price	−0,51	−2,26	−2,41
Real disposable income[1]	+1,03	+2,45	+2,13
Real total investment	+0,00	+0,00	+0,00
Real GDP	−0,03	+0,03	+0,07
Composite good[2]	+0,26	+0,45	+0,48
External terms of trade[3]	−0,04	−0,22	−0,49
Internal terms of trade[4]	+0,28	+1,37	+1,42
Export volumes	+0,09	+0,45	+1,00
Import volumes	+2,09	+6,32	+7,25
Current account, change in % of GDP	−0,64	−1,44	−1,45
Net Lending, change in % of GDP	−0,74	−3,04	−1,99
Private savings, change in % of GDP	+0,02	+0,06	−0,00

II. Sectoral effects

	Domestic output			Export volumes			Import volumes		
	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
1. Agricultural and food	−0,80	−0,10	−0,41	−0,23	+0,54	+1,35	+9,90	+8,25	+26,35
2. Building materials/constr.	+0,02	+0,05	−0,02	+0,04	+0,62	+0,64	+0,64	+4,26	−0,31
3. Intermediates	−0,19	−0,64	+0,04	−0,01	+0,62	+0,98	+0,79	+2,47	+2,05
4. Machinery	+0,12	−2,12	−0,49	+0,25	−0,60	+0,55	+1,45	+11,00	+6,50
5. Light manufacturing	+0,06	+0,50	+0,35	+0,26	+0,88	+1,29	+2,86	+7,29	+7,45
6. Material services	+0,17	+0,47	+0,21	+0,06	+0,48	+0,42	+0,64	+0,35	+0,84
7. Non-material services	+0,05	+1,20	+0,53	−0,03	−−	+0,85	+0,42	−−	−−

* Import tariff rates in all sectors set equal to zero.

(A) Austrian CGE Model of 1976.

(B) Hungarian CGE Model of 1977.

(C) Hungarian CGE Model of 1986.

1 Is equivalent to change in welfare as measured by a Cobb Douglas utility function.

2 Welfare can also be defined as the change in the composite good.

3 World prices for Austrian/Hungarian exports in relation to their prices for imports.

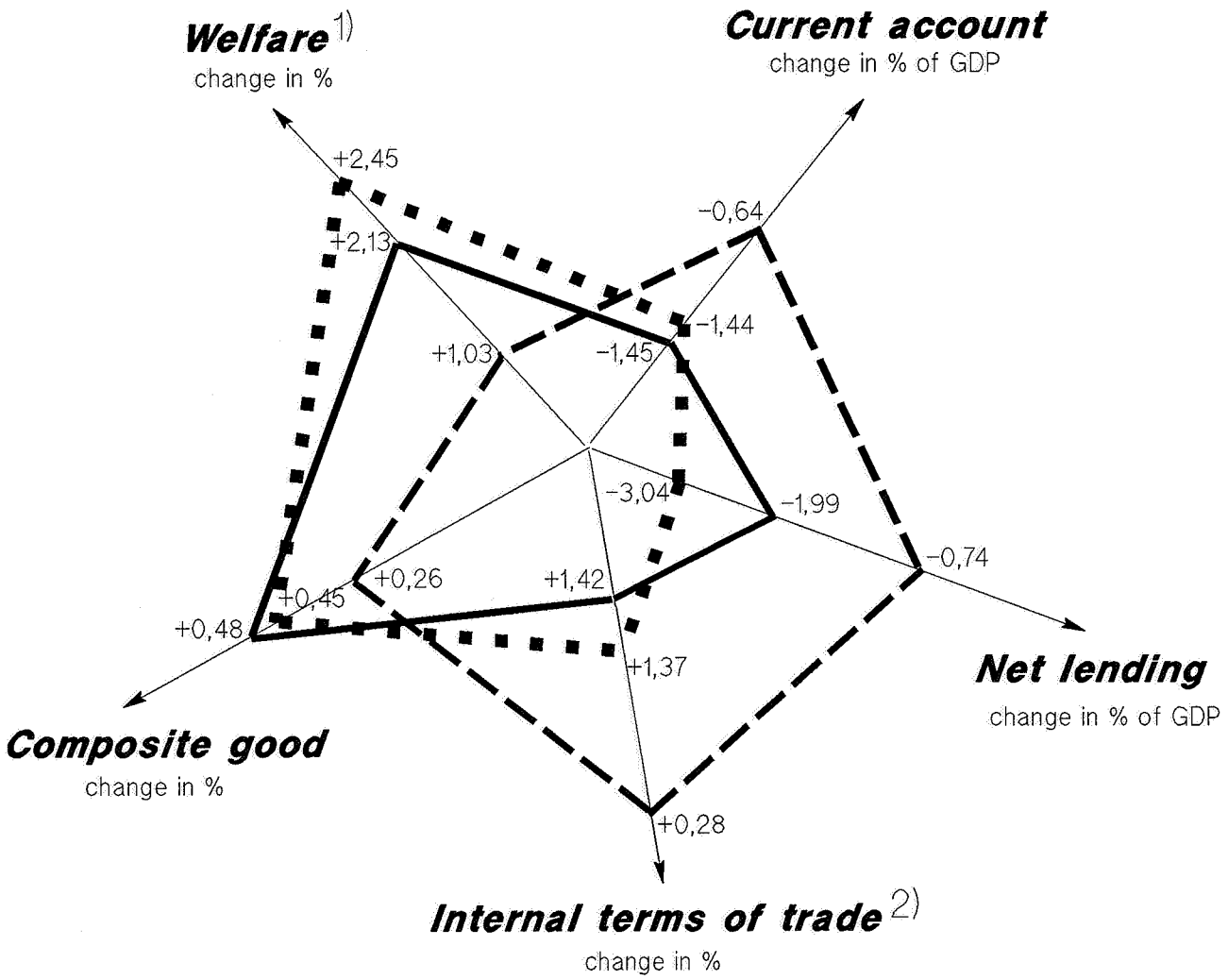
4 Export prices in relation to domestic goods prices - "real exchange rate". (increase is depreciation).

Figure 1

Free Trade Scenario

(Investment = fixed)

Macroeconomic Trade-Offs



A^{76} = Austrian CGE model of 1976

H^{77} = Hungarian CGE model of 1977

H^{86} = Hungarian CGE model of 1986

1) measured by real disposable income

2) "real exchange rate"

subsidies, followed by the consequences of a 30% subsidy cut in the agricultural sector (related to Uruguay round proposals) are studied.

The simulations are performed for both Hungary (1977 and 1986) and Austria (1976). Under the assumption that Hungary will transform to an Austrian-like market economy, we can show which reactions and effects can be expected for Hungary on the road to a market economy.

4.1 External Transformation

4.1.1 Free Trade Scenario

Unconstrained Foreign Borrowing

In the first set of free trade simulations we use the "neoclassical closure rule", i.e., real investment is fixed. Because there is no current account constraint, this implies that Austria and Hungary are able to borrow to finance current account deficits.

Hungary and Austria differ in the degree of import protection as can be seen from *Tables 1 to 3*. With few exceptions, tariff rates are much higher in Hungary than in Austria. In all simulations it is important to bear in mind that in Hungary only Dollar trade is affected by changes in tariff rates. This means that the Dollar import to production ratio is much lower than the total import to production ration, and that tariff changes affect only one half of imports.

Due to the free trade agreement between EFTA and the EC in 1972, manufactured good tariffs in Austria were to be eliminated by July 1977. Therefore, the 1976 data still includes some tariffs for imports from the EC. Today EFTA and EC trade in manufactured goods accounts for three fourths of the total, and so is completely tariff free.

For this simulation the tariff rates (t^M,t^{MD}) are set equal to zero in all sectors. The overall macroeconomic results (shown in *Figure 1*[3] and *Table 4*) are the following. As expected, the welfare gain measured either by the change in the composite goods or real disposable income, is higher in Hungary for both years than in Austria. On the other hand, there is a larger tariff revenue loss. The net lending position deteriorates since tariff revenues contribute substantially to government income. The stronger effect of liberalization in Hungary contributes also to a larger deterioration in the current account. The government deficit increases less in 1986 compared to 1977. Tariff levels declined overall by 1986, with only light manufacturing and

[3]In the graphical representation of the major macroeconomic results in the "spider diagram" a movement away from the center means an improvement in reaching the considered target. The macroeconomic results of the simulation presented in this type of diagram can also be interpreted in the light of the one-sector type graphical representation by *De Melo and Robinson* (1989).

Table 4A

Simulations IA:

Free Trade Scenario*

(Current Account = fixed)

(Per cent changes compared with benchmark solution)

	Austria (A)	Hungary (B)	Hungary (C)
I. Economy-wide effects			
Domestic goods price	−1,88	−5,97	−6,94
Composite goods price	−1,95	−6,44	−7,16
Real disposable income[1]	+1,10	+3,11	+3,48
Real total investment	−3,93	−7,94	−13,89
Real GDP	−0,05	−0,52	−0,75
Composite good[2]	−0,13	−0,49	−0,63
External terms of trade[3]	−0,47	−1,76	−1,83
Internal terms of trade[4]	+1,76	+4,48	+5,40
Export volumes	+0,96	+3,66	+4,02
Import volumes	+0,40	+1,69	+1,83
Current account, change in % of GDP	+0,00	+0,00	+0,00
Net Lending, change in % of GDP	−0,98	−4,37	−3,89
Private savings, change in % of GDP	+0,03	−0,10	−0,27

II. Sectoral effects

	Domestic output			Export volumes			Import volumes		
	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
1. Agricultural and food	−0,34	+1,99	+2,11	+1,53	+5,57	+7,24	+6,96	+1,51	+17,61
2. Building materials/constr.	−1,70	−5,60	−8,67	−0,72	−1,63	−3,48	−1,88	−4,56	−12,61
3. Intermediates	+0,01	+0,40	+0,49	+0,95	+3,55	+3,72	−0,70	−0,40	−1,41
4. Machinery	−0,44	−4,05	−3,29	+0,40	−0,28	+0,67	−0,52	+5,61	−0,49
5. Light manufacturing	+0,37	+1,03	+1,34	+1,34	+3,89	+4,61	+1,33	+3,47	+4,12
6. Material services	+0,25	+0,37	+0,42	+0,79	+2,38	+2,62	−0,18	−2,36	−1,66
7. Non-material services	+0,09	+1,93	+1,31	+0,67	−−	+3,56	−0,38	−−	−−

* Import tariff rates in all sectors set equal to zero.

(A) Austrian CGE Model of 1976.

(B) Hungarian CGE Model of 1977.

(C) Hungarian CGE Model of 1986.

[1] Is equivalent to change in welfare as measured by a Cobb Douglas utility function.

[2] Welfare can also be defined as the change in the composite good.

[3] World prices for Austrian/Hungarian exports in relation to their prices for imports.

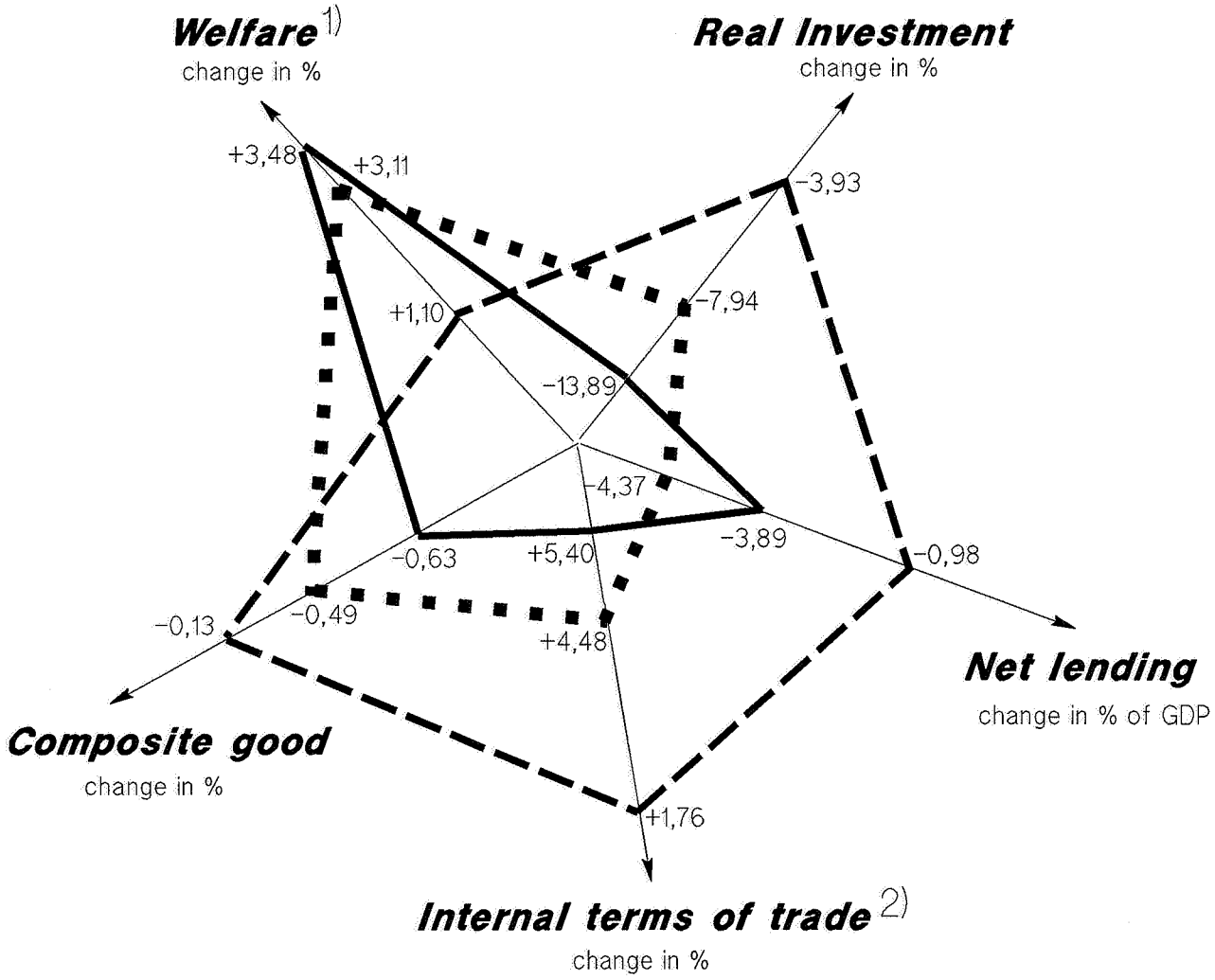
[4] Export prices in relation to domestic goods prices - "real exchange rate". (increase is depreciation).

Figure 2

Free Trade Scenario

(Current account = fixed)

Macroeconomic Trade-Offs



A^{76} = Austrian CGE model of 1976

H^{77} = Hungarian CGE model of 1977

H^{86} = Hungarian CGE model of 1986

1) measured by real disposable income

2) "real exchange rate"

agriculture higher. Whereas in Austria it is not necessary to depreciate very much (increase of the "real exchange rate"), Hungary in both years has to depreciate in order to remain competitive.

Looking at the sectoral effects, in general there is a strong relationship between the level of tariff protection and the increase in imports after liberalization (again assuming both countries can borrow to finance increased imports). There is little change in exports. The sectoral changes in output reflect the increases in imports, but are also affected by the import substitution elasticities, which differ by sector (see *Tables 1 to 3*). Overall, in those sectors where tariffs were the highest production decreased and imports increased the most after their elimination.

Constraints on Foreign Borrowing

By fixing the current account we assume that there are limits to borrowing from abroad. This is probably more true for Hungary after 1981 (it has the highest degree of foreign indebtedness per capita of all former CMEA countries). In Austria there are no external borrowing constraints. If the current account is fixed, adjustments must take place in investment.

The overall macroeconomic results (shown in *Figure 2* and *Table 4A*) are the following. Welfare effects measured by real disposable income are considerably higher than with the alternative closure in Hungary. However, welfare measured as the change in the composite good declines, because imports are not allowed to increase as much as in the case of unlimited foreign borrowing. In order to increase exports both countries would have to depreciate, but by much more in Hungary than in Austria. The loss of government revenue income is much stronger in this simulation.

On the sectoral level Austrian imports increase only in the 2 sectors with the highest tariff rates. In Hungary imports also increase in those sectors with the highest tariffs (agriculture, machinery and light manufactures). The increase in agricultural imports in 1986 reflects the increase in tariffs. Exports increase in most sectors in all 3 simulations due to the larger depreciation.

One of the major conclusions of the trade liberalization experiments is that in a country like Hungary, where government income depends to a considerable degree on import tariff revenues (in 1977 8.7% of total government revenue; in 1986 13.3%) there is a larger trade off in liberalization than for a country like Austria (2.1% share of tariffs in total government revenue). Increases of consumer welfare are accompagned by heavy budget revenue losses. Such effects are well known in developing countries (see, for example *Devarajan, Lewis, and Robinson* (1991); *Devarajan and Rodrik* (1991)).

A precondition for full liberalization of foreign trade would therefore be a tax reform. The tax base has to be shifted more to value added or income taxation as

Table 5

Simulations II:

Reorientation of Hungarian Trade*

(CGE Model of 1986)

(Per cent changes compared with benchmark solution)

	Investment fixed (A)	Current Account fixed (B)
I. Economy-wide effects		
Domestic goods price	−0,13	−5,08
Composite goods price	−0,32	−4,81
Real disposable income[1]	−1,84	−0,60
Real total investment	+0,00	−12,89
Real GDP	+0,73	−0,10
Composite good[2]	+0,90	−0,15
External terms of trade[3]	−0,36	−1,59
Internal terms of trade[4]	−1,26	+2,34
Export volumes	+0,91	+3,72
Import volumes	+3,41	−1,30
Current account, change in % of GDP	−1,26	+0,00
Net Lending, change in % of GDP	−1,30	−3,21
Private savings, change in % of GDP	−0,31	−0,55

II. Sectoral effects

	Domestic output		Export volumes		Import volumes	
	(A)	(B)	(A)	(B)	(A)	(B)
1. Agricultural and food	−3,19	−0,83	+2,02	+7,64	−11,22	−17,03
2. Building materials/constr.	+0,33	−7,73	+0,90	−2,97	−0,50	−11,85
3. Intermediates	+12,73	+13,12	+3,17	+5,72	+24,52	−20,65
4. Machinery	−5,68	−8,39	−3,54	−3,66	−7,56	−13,46
5. Light manufacturing	−1,71	−0,81	−0,17	+2,88	−3,62	−6,42
6. Material services	+0,11	+0,31	+1,61	+3,70	−1,92	−4,21
7. Non-material services	−0,42	+0,30	+0,87	+3,40	−−	−−

* Ruble exports and imports are lowered by 50% in all sectors.

1 Is equivalent to change in welfare as measured by a Cobb Douglas utility function.

2 Welfare can also be defined as the change in the composite good.

3 World prices for Austrian/Hungarian exports in relation to their prices for imports.

4 Export prices in relation to domestic goods prices - "real exchange rate". (increase is depreciation).

in Western market economies. Hungary implemented one tax reform in 1988 and is considering further changes. However, in 1989 tariff revenue still accounted for around 10% of government revenue.

On the sectoral level, the opening up to imports from the West is - as usual in small open economies - the best remedy to improve competitiveness.

4.1.2 Redirection of Trade in Hungary - "Dutch Disease in Reverse"

Redirecting its trade from the noncompetitive CMEA to the competitive Western, particularly the EC, market is one of Hungary's major tasks for the future. The "monocultural" trade orientation of Hungary to the CMEA since the Second World War has had detrimental structural effects to the economy comparable to those which one finds in the case of the "Dutch disease". The Dutch disease is characterized by an influx of capital into one sector (oil or gas) after an external world price increase (OPEC I and OPEC II). The production capacity of the traditional traded goods sector (manufacturing industry) deteriorates. In analogy, the CMEA trade of the former CPEs of Eastern Europe had similar detremental effects: the majority of resources were allocated to the noncompetitive CMEA export sector (especially manufactured goods) and to the neglect of the more competitive export sectors to the West. The consequence of the inefficiency of this trade and production pattern has proven to be disastrous.

The redirection of Hungary's trade flows from the East to the West can be interpreted as "curing the Dutch (or Ruble) disease" - or simply as a pro-competitive policy measure.

In the following policy experiment it is assumed that Ruble exports and imports are cut by 50%. Such dramatic changes are justified by recent developments in Hungary (see *Stankovsky* (1991); *GKI* (1991). *Zalai and Révész* (1991) simulate redirection of Hungarian trade under the assumption that Ruble exports will fall by 60%. The macroeconomic and sectoral effects appear in *Table 5*. Again the closure rule used is vital for the results. Therefore we use both the neoclassical and the currrent account closure rules.

Unconstrained Foreign Borrowing

If investment is fixed and the current account is allowed to adjust, the reversal of the "Dutch disease" leads to a deterioration of the Dollar current account by 1,3% of GDP. Welfare, measured by real disposable income falls by 1,8%, but the volume of the composite good, increases by 0,9% since overall real Dollar imports increase by 3,4%. The real exchange rate appreciates. The fiscal deficit increases by 1,3% of GDP.

The sectoral impact shows a dramatic increase in Dollar intermediate imports, while imports fall in all other sectors. Output also increases in the intermediate sector to make up for the fall in Ruble imports. Output falls the most in machinery, a main Ruble export sector. Exports also decline mainly in the machinery sector.

Constraints on Foreign Borrowing

When there is a constraint on foreign borrowing, the adjustment after cutting Ruble trade takes place in investment. Real investment would drop by 13%. Other macroeconomic effects differ when there is a constraint on foreign borrowing, as is more relevant for Hungary in the 1980's and 1990's. The decline in Dollar imports due to the drop in Ruble exports has been observed in 1990 and 1991 (see *GKI*, 1991). Fiscal revenue loss would increase more. The export-import flows change conversly compared to the former experiment. Export volumes increase and imports fall, due to a real depreciation. Real disposable income falls less, but the composite good volume falls as well.

Dollar imports fall substantially in all sectors. Output falls in most sectors with the exception of a large increase in intermediates. Dollar exports decrease the most in manufactured goods and increase more in the agricultural and intermediate sectors and hence move in the direction of a reversal of the "Dutch disease".

An obvious conclusion from these experiments is that the redirection of trade entails a great deal of macroeconomic and even more microeconomic adjustment. That this redirection is undertaken together with a full liberalization of imports from the West must be questioned because the burden for the budget and/or the current account would be too high.

4.1.3 Customs Union with the EC

As a variation of the "free trade scenario" we consider the special case if both countries were to join the EC. This simulation is more realistic for Austria (it applied for EC membership already in July 1989) than for Hungary, but it is nevertheless interesting to see which effects both countries can expect, given the present structure of import tariffs. The simulations are carried out under the current account closure rule (current account is fixed).

The two customs union simulations differ only in the case of agriculture tariffs. The first simulation (*Table 6*) changes all tariff rates to EC levels, including the effect of the common agricultural policy of the EC (CAP) with a 27% tariff on agricultural imports. These tariff levels are much lower than most tariffs for Hungary, especially in 1977, but higher for agriculture tariffs. Austrian tariff levels were much closer to EC levels; somewhat higher only in machinery and light manufactures and much

Table 6

Simulations III:

Customs Union with the EC*

(Per cent changes compared with benchmark solution)

	Austria	Hungary	
	(A)	(B)	(C)
I. Economy-wide effects			
Domestic goods price	+2,54	+4,30	−1,26
Composite goods price	+2,31	+3,55	−1,59
Real disposable income[1]	−0,59	−0,50	+0,98
Real total investment	+2,49	+1,83	−4,21
Real GDP	−0,01	−0,13	−0,33
Composite good[2]	+0,12	+0,11	−0,24
External terms of trade[3]	+0,76	+1,82	−0,16
Internal terms of trade[4]	−1,74	−2,32	+1,10
Export volumes	−1,51	−3,53	+0,35
Import volumes	−0,66	−0,07	+0,02
Current account, change in % of GDP	+0,00	+0,00	+0,00
Net Lending, change in % of GDP	+0,60	−0,53	−1,51
Private savings, change in % of GDP	+0,08	+0,21	+0,01

II. Sectoral effects

	Domestic output			Export volumes			Import volumes		
	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
1. Agricultural and food	+2,67	+1,27	+1,30	−1,82	−5,64	+0,53	−24,30	−20,14	−17,08
2. Building materials/constr.	+1,08	+1,24	−2,70	+0,04	−0,43	−1,31	+2,13	+7,48	−3,91
3. Intermediates	−0,72	−1,97	−0,23	−1,57	−2,47	+0,68	+1,39	+3,72	+0,66
4. Machinery	−0,07	−2,24	−1,63	−0,77	−2,44	−0,30	+2,13	+12,69	+4,06
5. Light manufacturing	−1,10	−0,70	−0,04	−2,04	−2,65	+0,72	+2,80	+8,67	+5,54
6. Material services	−0,22	−0,03	+0,00	−1,11	−1,75	+0,23	+1,07	+1,97	+0,32
7. Non-material services	−0,01	+0,25	+0,41	−0,89	−−	+0,67	+1,11	−−	−−

* Import tariff rates in all sectors set equal to EC tariffs.

(A) Austrian CGE Model of 1976.

(B) Hungarian CGE Model of 1977.

(C) Hungarian CGE Model of 1986.

[1] Is equivalent to change in welfare as measured by a Cobb Douglas utility function.

[2] Welfare can also be defined as the change in the composite good.

[3] World prices for Austrian/Hungarian exports in relation to their prices for imports.

[4] Export prices in relation to domestic goods prices - "real exchange rate". (increase is depreciation).

Table 6A

Simulations IIIA:

Customs Union with the EC*

(Per cent changes compared with benchmark solution)

	Austria	Hungary	
	(A)	(B)	(C)
I. Economy-wide effects			
Domestic goods price	−0,25	−3,58	−3,30
Composite goods price	−0,29	−4,06	−3,57
Real disposable income[1]	+0,22	+2,07	+1,80
Real total investment	−0,71	−5,14	−7,26
Real GDP	−0,01	−0,35	−0,42
Composite good[2]	−0,02	−0,31	−0,35
External terms of trade[3]	−0,05	−0,94	−0,78
Internal terms of trade[4]	+0,26	+2,72	+2,57
Export volumes	+0,11	+1,94	+1,67
Import volumes	+0,05	+1,11	+0,62
Current account, change in % of GDP	+0,00	+0,00	+0,00
Net Lending, change in % of GDP	−0,18	−3,22	−2,27
Private savings, change in % of GDP	−0,00	−0,04	−0,10

II. Sectoral effects

	Domestic output			Export volumes			Import volumes		
	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
1. Agricultural and food	+0,09	+1,60	+1,45	+0,22	+2,88	+2,95	−0,27	−2,80	−3,25
2. Building materials/constr.	−0,31	−3,64	−4,56	−0,16	−1,09	−1,88	−0,41	−1,84	−6,96
3. Intermediates	−0,00	−0,00	+0,09	+0,10	+2,05	+1,73	−0,22	+0,10	−0,35
4. Machinery	−0,13	−3,37	−2,10	+0,03	−0,66	+0,10	+0,21	+6,89	+2,27
5. Light manufacturing	−0,03	+0,64	+0,48	+0,16	+2,29	+2,09	+0,92	+3,28	+4,40
6. Material services	+0,04	+0,28	+0,16	+0,11	+1,41	+1,11	−0,06	−1,64	−0,53
7. Non-material services	+0,02	+1,39	+0,70	+0,09	−−	+1,68	−0,08	−−	−−

* Import tariff rates in sectors 2 to 7 set equal to EC tariffs, unchanged in sector 1.

(A) Austrian CGE Model of 1976.

(B) Hungarian CGE Model of 1977.

(C) Hungarian CGE Model of 1986.

[1] Is equivalent to change in welfare as measured by a Cobb Douglas utility function.

[2] Welfare can also be defined as the change in the composite good.

[3] World prices for Austrian/Hungarian exports in relation to their prices for imports.

[4] Export prices in relation to domestic goods prices - "real exchange rate". (increase is depreciation).

lower in agriculture (see *Tables 1 to 3*)[4].

The macro results are not as consistent for the *first customs union simulation* as in the free trade case only. Austria and Hungary in 1977 have a decrease in real disposable income, but a small increase in the composite good, whereas in Hungary 1986 has the opposite. As in the free trade simulation, Austria's net lending position shows the largest improvement (or smallest deterioration) since less adjustment was necessary. Real investment increases in Austria and by less in in Hungary in 1977 and falls in 1986.

The sectoral effects (*Table 6*) are also interesting. We can see a large impact from the increase in agricultural tariffs (and decrease in the others for Hungary). Agriculture imports fall and output increases in all 3 cases. The smallest change in imports is for Hungary 1986, which had the highest tariff level. Agricultural exports fall also (except a slight increase in 1986) as do most exports by a lesser amount. Exports fall the most for Hungary 1977, which showed a larger appreciation in the real exchange rate or internal terms of trade. The real exchange rate depreciates slightly in 1986. Although Hungary had a larger agricultural sector and a large decrease in agricultural imports and increase in production, imports are up in all other sectors due to the large decline in the other tariff rates.

The *second customs union simulation* retains current agricultural import tariffs and changes the other sectors to EC levels. In this case Hungary in 1986 had the highest level of agricultural protection. The simulation without the high CAP levels of agricultural protection (*Table 6A*), indicate that the differences in ordering between simulations for Hungary in case of adjusting to the CAP level (*Table 6*) are due to the high agriculture tariffs. Here the general pattern of the macroeconomic results are the same as those for free trade (*Table 4*): the Hungarian models show greater welfare gains and larger price decreases due to the larger drop in import tariffs. Austria has a smaller deterioration in government lending. Real investment declines in both countries, but by much more in Hungary.

The effects of the EC tariff levels without the distortion of large increases in agriculture tariffs shows a somewhat different sectoral picture (*Table 6A*). Imports decrease in all sectors, including agriculture, except machinery and light manufacturing. Again, these decreases are larger for Hungary. Export performance is mixed, down slightly for building materials and construction, but up in the other sectors and little changed for Austria. The real exchange rate depreciates more in Hungary than in Austria. Output decreases for building materials/ construction and machinery as well. Except for the effects on farmers and on disposable income, Hungary would be better off lowering overall tariffs without increasing those in agriculture.

[4]In accordance with tariff comparisons with the EC (see *Breuss and Stankovsky*, 1988) we assume that the common external tariff rates in the EC in our sectoral specification will be the following: sector 1: 27%, sector 2: 1,3%, sector 3: 1,7%, sector 4: 2,0%, sector 5: 2,5%, sector 6: 0,7% and sector 7: 0,6%.

Table 7

Simulations IV:

External Price Shock*

(Per cent changes compared with benchmark solution)

	Austria (A)	Hungary (B)	Hungary (C)
I. Economy-wide effects			
Domestic goods price	+1,64	+0,81	+1,35
Composite goods price	+0,60	+0,23	+0,79
Real disposable income[1]	+1,79	+1,22	+0,65
Real total investment	+3,19	+2,72	+4,67
Real GDP	−0,10	+0,06	+0,19
Composite good[2]	+0,77	+0,59	+0,61
External terms of trade[3]	+5,70	+0,29	+0,34
Internal terms of trade[4]	−0,85	−0,16	−0,77
Export volumes	−0,82	−0,58	−0,73
Import volumes	+4,95	+5,23	+5,32
Current account, change in % of GDP	+0,00	+0,00	+0,00
Net Lending, change in % of GDP	+0,52	+0,44	+0,98
Private savings, change in % of GDP	+0,10	+0,08	+0,13

II. Sectoral effects

	Domestic output			Export volumes			Import volumes		
	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
1. Agricultural and food	−1,01	−1,06	−1,00	−2,10	−0,99	−1,73	+13,41	+10,61	+12,67
2. Building materials/constr.	+1,43	+1,98	+2,85	+0,58	+1,03	+1,41	+4,80	+5,34	+6,72
3. Intermediates	−0,90	−0,76	−0,37	−1,07	−0,52	−0,46	+3,71	+2,97	+3,84
4. Machinery	+0,67	+0,41	+0,86	+0,20	+0,07	+0,16	+4,13	+3,43	+4,36
5. Light manufacturing	−0,21	+0,09	−0,18	−0,81	−0,48	−0,68	+5,18	+4,96	+4,68
6. Material services	+0,23	+0,24	−0,04	−0,69	−0,43	−0,76	+4,07	+3,70	+3,59
7. Non-material services	+0,08	+0,34	+0,01	−0,79	−−	−0,65	+3,78	−−	−−

* 5 % decrease in import prices due to completion of the EC's single market '92.

(A) Austrian CGE Model of 1976.

(B) Hungarian CGE Model of 1977.

(C) Hungarian CGE Model of 1986.

1 Is equivalent to change in welfare as measured by a Cobb Douglas utility function.

2 Welfare can also be defined as the change in the composite good.

3 World prices for Austrian/Hungarian exports in relation to their prices for imports.

4 Export prices in relation to domestic goods prices - "real exchange rate". (increase is depreciation).

The effects for Austria may be biased upwards. The present model calibration does not disdinguish foreign trade according to regions, so it implies that the import tariffs apply to total trade. In reality however - due to the EFTA membership and free trade arrangement with the EC - three fourths of total trade in manufactured goods (that is the share of trade with the EC and EFTA) is completely liberalized. The existing tariffs are therefore only due on one third of total trade. Whereas welfare and price effects of the formation of a customs union with the EC would have virutally no static effects in Austria, in Hungary this step would cause considerable adjustment costs (which can be seen from the deterioration in the net lending position of the government). Similar to the case of complete free trade, it is not feasible for Hungary to liberalize trade in one step. Only a gradual transition could cushion the necessary macro and microeconomic adjustments.

4.1.4 External Price Shock due to EC's Single Market 1992

The EC plans to complete its internal market by the end of 1992. According to estimates by the EC commission ("Cecchini report", see *Emerson et al.* (1988)) this integration process will result in considerable welfare gains within the EC. The price level is expected to decrease and productivity and therefore GDP to increase, mainly due to a variety of so-called supply-side effects (intensification of competition, harmonization of industrial norms and competition rules, lessening of price segmentation by national markets, exploitation of economies of scale).

The decrease of the price level within the EC also translates to foreign prices. In accordance with macroeconomic model simulations of the impact of EC's single market on Austria's economy (see *Breuss and Schebeck* (1989, 1991)) we assume that all import prices drop by 5% (whether Austria is a member of EC or not). The same assumption is made for Hungary. Taking into account such a reduction in import price levels we also capture the integration effect of a formation of a customs union with the EC, though these effects are more passive than those of the simulations 3.

The simulation results (*Table 7*) run under the assumption of foreign borrowing constraints (current account is fixed) can be summarized as follows: The integration effects measured by the gains in welfare (real disposable income or changes in the composite good) are the highest in Austria. Secondly they are much higher in Austria than in the case of forming a customs union with the EC (*Table 6 and 6A*) and also higher than in the case of complete liberalization (*Table 4A*). The welfare effects in Hungary are lower than those of the customs union and in the free trade case. Hungary's real exhange rate would appreciate, but less than Austria's. The fiscal budget would improve slightly in both countries. Real investemt would increase.

Imports increase in all sectors in both countries, but especially in Agriculture. Exports decline slightly in all sectors except construction and machinery. Output

Table 8

Simulations V:

Total Subsidy Cut by 10%*

(Per cent changes compared with benchmark solution)

	Austria (A)	Hungary (B)	Hungary (C)
I. Economy-wide effects			
Domestic goods price	−0,17	+0,15	−0,06
Composite goods price	−0,14	+0,11	−0,08
Real disposable income[1]	−0,43	−1,61	−0,54
Real total investment	+1,15	+2,69	+1,62
Real GDP	+0,02	+0,05	+0,05
Composite good[2]	+0,03	+0,08	+0,01
External terms of trade[3]	−0,12	−0,03	+0,00
Internal terms of trade[4]	+0,08	−0,17	−0,02
Export volumes	+0,23	+0,07	+0,00
Import volumes	+0,09	−0,09	−0,01
Current account, change in % of GDP	+0,00	+0,00	+0,00
Net Lending, change in % of GDP	+0,24	+2,16	+0,75
Private savings, change in % of GDP	−0,02	−0,09	−0,08

II. Sectoral effects

	Domestic output			Export volumes			Import volumes		
	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
1. Agricultural and food	−0,47	+0,17	−0,28	−0,42	+1,11	+0,17	−0,11	−2,11	−1,01
2. Building materials/constr.	+0,49	+1,80	+0,99	+0,47	+0,93	+0,37	+0,39	+2,44	+1,54
3. Intermediates	+0,31	−0,36	−0,20	+0,33	−0,71	+0,27	+0,15	+0,45	−0,01
4. Machinery	+0,38	+0,56	+0,14	+0,40	+0,07	−0,15	+0,25	+1,14	+0,53
5. Light manufacturing	+0,11	−0,49	−0,14	+0,17	−0,38	+0,06	−0,07	−0,49	−0,41
6. Material services	−0,13	−0,66	+0,07	−0,04	−0,78	+0,42	−0,22	−0,32	−0,42
7. Non-material services	−0,03	−0,67	−0,02	+0,11	−−	+0,34	−0,20	−−	−−

* Decrease (increase) of subsidies (net indirect taxes) by 10% in Austria (Hungary).

(A) Austrian CGE Model of 1976.

(B) Hungarian CGE Model of 1977.

(C) Hungarian CGE Model of 1986.

1 Is equivalent to change in welfare as measured by a Cobb Douglas utility function.

2 Welfare can also be defined as the change in the composite good.

3 World prices for Austrian/Hungarian exports in relation to their prices for imports.

4 Export prices in relation to domestic goods prices - "real exchange rate". (increase is depreciation).

falls in agriculture and intermediates.

Overall, the EC's completion of the single market may cause higher welfare gains for Austria because it is already more integrated into the EC than Hungary. Nevertheless the effects of such an external price shock are positive for both countries.

4.2 Internal Transformation

One of the preconditions for creating competitive markets within the economy of former CPEs is the restoration of a market based price system. The price system was distorted by many ways, one of which was subsidization. The inflationary consequences of removing price subsidization has been analyzed theoretically with a dynamic macro model by *Calvo and Frenkel* (1991) and with a CGE model for Yusgoslavia by *Adelman, Berck, and Vujovic* (1990). In the following country comparison we experiment with two policy shocks. First, subsidies in all sectors are cut by 10% and second, subsidies are cut in the agricultural sector only by 30%.

Both Simulations are made under the assumption that there are constraints in foreign borrowing (current account is fixed).

4.2.1 Overall Subsidy Cuts

The two countries have very different tax structures. Whereas in Austria indirect taxes (in particular the value added tax) make up the major part of tax revenues, in Hungary indirect taxation played a smaller role. Tariff revenue was a larger part of government revenue and higher subsidies existed, both as direct export subsidies and as net indirect subsidies in Agriculture in both years and in the service sectors in 1986.

Since we have only net tax figures for Hungary, we decrease the net level of subsidies (or increase net indirect taxes for those sectors with positive net taxes $(t_i^X - t_i^S)$. Because in Austria subsidies are statistically separated, we simulate decreases of subsidies directly (t_i^S).

An overall "subsidy" cut by 10% leads to the following macroeconomic consequences (*Table 8*). Whereas in macroeconomic models one captures inflationary effects after subsidy cuts, in CGE models only relative price changes matter. These relative price changes determine the sectoral allocation. Because overall internal terms of trade change only slightly aggregate exports and imports remain nearly unchanged. The reduction of subsidies leads to a reduction in value added prices and therefore factor income. Welfare as measured by real disposable income declines. As expected with lower subsidies (or higher indirect taxes) the budgetary position of the government improves. Real investement is stimulated.

Table 8A

Simulations VA:

30 % Subsidy Cut in Agricultural Sector*

(Per cent changes compared with benchmark solution)

	Austria (A)	Hungary (B)	Hungary (C)
I. Economy-wide effects			
Domestic goods price	−0,23	−0,13	−0,29
Composite goods price	−0,18	−0,11	−0,25
Real disposable income[1]	−0,48	−0,20	−0,60
Real total investment	+1,03	+0,53	+2,47
Real GDP	−0,02	+0,06	+0,20
Composite good[2]	−0,03	+0,02	+0,12
External terms of trade[3]	−0,17	−0,00	−0,05
Internal terms of trade[4]	+0,20	+0,08	+0,12
Export volumes	+0,34	−0,01	+0,02
Import volumes	+0,14	+0,04	+0,23
Current account, change in % of GDP	+0,00	+0,00	+0,00
Net Lending, change in % of GDP	+0,22	+0,25	+0,68
Private savings, change in % of GDP	−0,02	−0,01	−0,06

II. Sectoral effects

	Domestic output			Export volumes			Import volumes		
	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
1. Agricultural and food	−1,59	−0,41	−1,29	−2,13	−0,46	−1,41	+1,15	+0,11	+0,29
2. Building materials/constr.	+0,47	+0,39	+1,61	+0,56	+0,39	+1,42	+0,23	+0,30	+1,44
3. Intermediates	+0,44	+0,16	+0,38	+0,55	+0,22	+0,51	+0,04	−0,03	+0,03
4. Machinery	+0,48	+0,26	+0,86	+0,55	+0,30	+0,86	+0,20	+0,12	+0,63
5. Light manufacturing	+0,14	+0,08	+0,30	+0,24	+0,21	+0,60	−0,14	−0,15	−0,31
6. Material services	+0,03	+0,07	+0,21	+0,21	+0,18	+0,53	−0,24	−0,10	−0,31
7. Non-material services	−0,02	+0,01	+0,06	+0,17	−−	+0,38	−0,26	−−	−−

* Increase (decrease) of subsidies (net indirect taxes) by 30% in Austria (Hungary).

(A) Austrian CGE Model of 1976.

(B) Hungarian CGE Model of 1977.

(C) Hungarian CGE Model of 1986.

1 Is equivalent to change in welfare as measured by a Cobb Douglas utility function.

2 Welfare can also be defined as the change in the composite good.

3 World prices for Austrian/Hungarian exports in relation to their prices for imports.

4 Export prices in relation to domestic goods prices - "real exchange rate". (increase is depreciation).

4.2.2 Subsidy Cut in Agricultural Sector

We also study a decrease of subsidies by 30% in the agricultural sector only. These types of proposals were made in the so far unsuccessful Uruguay Round of GATT in order to liberalize international trade in agricutural products. Such sectoral subsidy cuts are necessary not only for a country in transition (Hungary) but also for a market economy which is engaged in international trade in agricultural products (Austria).

The macroeconomic and sectoral results can be seen from *Table 8A*. In Austria the welfare losses are more pronounced than in Hungary 1977, but similar to Hungary 1986. The sectoral effects are more clear-cut than in the overall subsidy-cut scenario. Due to the elimination of subsidies, prices increase in the agricultural sector. Income declines and therefore production and exports are reduced more in Austria than in Hungary. In all other sectors the relative price changes lead to an increase in production and exports. The increase of relative prices in the agricultural sector leads to higher imports in Austria relative to other sectors. Imports are little changed in Hungary.

Both cuts in overall subsidies and in agriculture only have similar macro-effects. The main difference is of course in the sectoral impact. The larger decrease in agriculture subsidies decreases output and exports in that sector.

5 Conclusions

We have approached the problem of Hungary's transformation from a partially centrally planned to a market oriented economy with a cross-country comparison using 2 models of Hungary, 1977 and 1986 and of Austria (1976). These three models represent a continuum of small open economies and allow a "quasi-dynamic" analysis using static CGE models.

We examined 2 types of transformational isssues: external (trade liberalization, import prices reductions and redirection of foreign trade - "Dutch disease reversal") and internal (decreases in subsidy levels).

The results clearly show the trade offs and interdependence of policies in the Hungarian transformation process. Although trade liberalization is necessary to increase competition in a small open economy and improve welfare, the costs in current account deficits, if foreign borrowing is possible, and larger government deficits may be too high. Hungary, with a very high level of external debt, has little possibility of increasing foreign borrowing. The related structural issue is the amount of government revenue coming from tariffs. Until the tax structure is changed any trade liberalization will have a large detrimental effect on the government deficit.

The redirection of trade from CMEA toward the West is happening faster than could have been predicted. Although Dollar area imports have declined along with Ruble exports, the net effect is still to increase the government deficit. It may not be financially possible for Hungary to pursue full trade liberalization in the face of this shock.

In the case of internal policy the role of tax structure is again important. Both an overall decrease in subsidies and a larger decrease in agricultural subsidies help lower the government deficit with only a small decrease in welfare, as measured by the change in real disposable income. This seems to be one of the more possible areas of liberalization.

Overall it is clear that with Hungary's borrowing constraints, liberalization should not be pursued all at once. A change in the tax structure is necessary at the same time. The results for Austria indicate that with a more liberalized trade system and a higher degree of Western integration, the welfare improvements are smaller with increased liberalization, but are also more possible with smaller increases in the current account and government deficits.

References

Adelman, I., Berck, P., Vujovic, D. , *"Designing Gradual Transition to Market Economies"*, Paper presented at the World Congress of the Econometric Society, in Barcelona, Spain, August 23-29, **1990**.

Breuss, F., Schebeck, F. , *"Die Vollendung des EG Binnenmarktes. Gesamtwirtschaftliche Auswirkungen für Österreich. Makroönkonomische Modellsimulationen"*, WIFO Gutachten, Wien, Februar **1989** (English version: The Completion of EC's Internal Marekt and its Impact on the Austrian Economy. Macroeconomic Model Simulations), WIFO Working Papers, No. 31, Vienna, *1989.*

Breuss, F., Schebeck, F. , *"Österreich im EWR. Gesamtwirtschaftliche Auswirkungen"*, WIFO-Monatsberichte, 5/**1991**, pp. 285-290.

Breuss, F., Stankovsky, J. , *Österreich und der EG-Binnenmarkt*, Wien *1988.*

Breuss, F., Tesche, J. , *"A CGE Model of Austria. Some Implications of Trade Liberalization"*, Empirica - Austrian Economic Papers (forthcoming), **1991**.

Calvo, G.A., Frenkel, J.A. , *"From Centrally Planned to Market Economy. The Road from CPE to PCPE"*, IMF Staff Papers, Vol. 38, No. 2, June **1991**, pp. 268-299.

Dervis, K., Melo, J. de, Robinson, S. , *General Equilibrium Models for Development Policy*, Cambrigde, **1982**.

Devarajan, S., Lewis, J.D. , *"Structural Adjustment and Economic Reform in Indonesia: Model-Based Policies vs. Rules-of-Thumb"*, Paper presented at the Fourth IIASA Task Force Meeting on Applied General Equilibrium Modelling, Laxenburg, 23-25 August, **1989**.

Devarajan, S., Lewis, J.D., Robinson, S. , *"From Stylized to Applied Models: Building Multisector CGE Models for Policy Analysis"*, Unpublished Paper, June **1991**.

Devarajan, S., Rodrik, D. , *"Pro-competitive effects of trade reform. Results from a CGE model of Cameroon"*, European Economic Review, Vol. 35, No. 5, July **1991**.

Emerson, M. et al. , *The economics of 1991. An assessment of the potential economic effects of completing the internal market of the European Community*, European Economy, No. 35, Brussels, March **1988**.

GKI , *Economic Outlook in Hungary 1991*, GKI - Gazdaságkutató Intézet, (Economic Research Institute), Budapest, June **1991**.

Kornai, J. , *The Road to a Free Economy. Shifting from a Socialist System: The Example of Hungary"*, New York **1990.**

Lipton, D., Sachs, J. , *"Creating a Market Economy in Eastern Europe: The Case of Poland"*, Brookings Papers on Economic Activity: I/**1990**, pp. 75-147.

Melo, J. de, Robinson, S. , *"Product Differentiation and the Treatment of Foreign Trade in Computable General Equilibrium Models of Small Economies"*, Journal of International Economics, Vol. 27, No. 1/2, August *1989*, pp. 47-67.

Stankovsky, J. , *"Osteuropas Öffnung zum Westen"*, WIFO-Monatsberichte Nr. 6, **1991**, pp. 330-344.

Tesche, J. , *"Alternative Adjustments to External Shocks in Hungary: 1972-81"*, Journal of Policy Modeling (forthcoming), **1991.**

Zalai, E., Révész, T. , *"Trade Redirection and Liberalization: Lessons from a Model Simulation"*, AULA, Society and Economy, Budapest University of Economic Sciences, Vol. XII, No. 2, 2/**1991**, pp. 69-80.

Appendix:
I. Equations of the CGE Model of Austria

Production and Factors of Production

$$X_i = a_i^D L_i^{\alpha_i} K_i^{(1-\alpha_i)} \tag{1}$$

$$W_L WDIST_{Li} = \frac{\alpha_i P_i^V X_i}{L_i} \quad \text{and} \quad W_K WDIST_{Ki} = \frac{(1-\alpha_i) P_i^V X_i}{K_i} \tag{2}$$

$$INT_i = \sum_{j=1}^{n} a_{ij} X_j \tag{3}$$

$$P_i^V = P_i^X \left[1 - (t_i^X - t_i^S)\right] - \sum_{j=1}^{n} P_j a_{ji} \tag{4}$$

Foreign Trade

$$Q_i = a_i^C \left[\delta_i M_i^{-\rho_i^C} + (1-\delta_i) D_i^{-\rho_i^C}\right]^{\frac{-1}{\rho_i^C}} \tag{5}$$

$$M_i = D_i \left[\left(\frac{P_i^D}{P_i^M}\right)\left(\frac{\delta_i}{1-\delta_i}\right)\right]^{\frac{1}{(1+\rho_i^C)}} \tag{6}$$

$$P_i^M = PW_i^M (1 + t_i^M) ER \tag{7}$$

$$P_i = \frac{P_i^D D_i + P_i^M M_i}{Q_i} \tag{8}$$

$$X_i = a_i^T \left[\gamma_i E_i^{\rho_i^T} + (1-\gamma_i) D_i^{\rho_i^T}\right]^{\frac{1}{\rho_i^T}} \tag{9}$$

$$E_i^s = D_i \left[\left(\frac{P_i^E}{P_i^D}\right)\left(\frac{1-\gamma_i}{\gamma_i}\right)\right]^{\frac{1}{\rho_i^T - 1}} \tag{10}$$

$$E_i^d = econst_i \left(\frac{PW_i^E}{PWSE_i}\right)^{-\rho_i^E} \tag{11}$$

$$P_i^E = PW_i^E (1 + t_i^E) ER \tag{12}$$

$$P_i^X = \frac{P_i^D D_i + P_i^E E_i}{X_i} \tag{13}$$

Income and Savings

$$Y^{F,lab} = \sum_{i=1}^{n} W_L WDIST_{Li} L_i \qquad \text{and} \qquad Y^{F,cap} = \sum_{i=1}^{n} W_K WDIST_{Ki} K_i \tag{14}$$

$$Y^{lab} = Y^{F,lab} - WTAX \tag{15}$$

$$Y^{ent} = Y^{F,cap} + ENTSUB - DEP - ENTSAV - ENTTAX - GPROF \tag{16}$$

$$Y^{H} = Y^{lab} + HHT + Y^{ent} + REMIT * ER \tag{17}$$

$$TARIFF = \sum_{i=1}^{n} t_i^M PW_i^M M_i ER \tag{18}$$

$$INDTAX = \sum_{i=1}^{n} t_i^X P_i^X X_i \tag{19}$$

$$INDSUB = \sum_{i=1}^{n} t_i^S P_i^X X_i \tag{20}$$

$$NETSUB = \sum_{i=1}^{n} t_i^E PW_i^E E_i ER \tag{21}$$

$$WTAX = \sum_{i=1}^{n} W_L L_i t_i^W \tag{22}$$

$$ENTTAX = \left(Y^{F,cap} - DEP\right) t^{ent} \tag{23}$$

$$TOTHHTAX = Y^H t^H \tag{24}$$

$$DEP = \sum_{i=1}^{n} depr_i P_i^K K_i \tag{25}$$

$$ENTSAV = ents\left(Y^{F,cap} + ENTSUB - ENTTAX - DEP\right) \tag{26}$$

$$HHSAV = mpsY^H(1 - t^H) \tag{27}$$

$$\begin{aligned} GR \;=\; & TARIFF + INDTAX - INDSUB + WTAX + \\ & TOTHHTAX + GPROF + ENTTAX + FBOR * ER \end{aligned} \tag{28}$$

$$\begin{aligned} SAVINGS \;=\; & HHSAV + GOVSAV + DEP + \\ & FSAV * ER + ENTSAV \end{aligned} \tag{29}$$

Final Demand

$$C_i = \frac{\beta_i^H (1 - mps) Y^H (1 - t^H)}{P_i} \tag{30}$$

$$G_i = \beta_i^G GDTOT \tag{31}$$

$$DST_i = dstr_i X_i \tag{32}$$

$$FXDINV = INVEST - \sum_{i=1}^{n} P_i DST_i \tag{33}$$

$$DK_i = \frac{kish_i FXDINV}{P_i^K} \tag{34}$$

$$TOTINV = \sum_{i=1}^{n} DK_i \tag{35}$$

$$ID_i = \sum_{j=1}^{n} b_{ij} DK_j \tag{36}$$

$$P_i^K = \sum_{j=1}^{n} P_j b_{ji} \tag{37}$$

Market Clearing

$$Q_i = INT_i + C_i + G_i + ID_i + DST_i \tag{38}$$

$$\sum_{i=1}^{n} L_i = L^S \qquad \text{and} \qquad \sum_{i=1}^{n} K_i = K^S \tag{39}$$

$$GR = \sum_{i=1}^{n} P_i G_i + GOVSAV + ENTSUB + HHT + NETSUB \tag{40}$$

$$\sum_{i=1}^{n} PW_i^M M_i = \sum_{i=1}^{n} PW_i^E E_i + REMIT + FBOR + FSAV \tag{41}$$

$$SAVINGS = INVEST \tag{42}$$

II. Definitions of Indices, Variables, and Parameters

Indices

i, j	7 Sectors:
	Agriculture and food
	Building materials and construction
	Intermediates (mining, electricity, metals and chemicals)
	Machinery
	Light manufacturing (industrial consumer goods)
	Material services
	Non-material services

Variables

Production and Factors of Production

Endogenous

X_i	Domestic output
L_i	Demand for labor
K_i	Demand for capital
INT_i	Intermediate input demand
W_L	Average wage rate
W_K	Average rental of capital
P_i^V	Value-added price, net of indirect taxes
P_i^X	Average output price
P_i	Price of composite good

Exogenous

a_i^D	Cobb-Douglas Production function shift parameter
α_i	Production function share parameter
$WDIST_{1,i}$	Labor market distortion parameters

$WDIST_{Ki}$	Capital market distortion parameters (ratio of factor price paid to factors L, K in sector i to average factor price earned by factors L, K)
a_{ij}	Input-output coefficients
t_i^X	Indirect tax rates
t_i^S	Indirect subsidy rates

Foreign Trade

Endogenous

Q_i	Composite goods supply
M_i	Imports
D_i	Domestic sales (domestic consumption of domestic goods)
P_i^D	Domestic goods price
P_i^M	Domestic price of imports
E_i^d	Demand for Exports
E_i^s	Supply of Exports
P_i^E	Domestic price of exports
PW_i^E	World price of exports, Dollar

Exogenous

a_i^C	Armington (CES) function shift parameter
δ_i	Armington (CES) function share parameter
ρ_i^C	Armington (CES) function exponent
PW_i^M	World market price of imports, Dollar
ER	Exchange rate, Schilling/Dollar
t_i^M	Import tariff rates
a_i^T	CET function shift parameter
γ_i	CET function share parameter
ρ_i^T	CET function exponent
$econst_i$	Export demand function shift parameter
$PWSE_i$	World price of export substitutes
ρ_i^E	Export demand price elasticity
t_i^E	Export subsidy rates

Income and Savings

Endogenous

$Y^{F,lab}$	Factor income labor, gross
$Y^{F,cap}$	Factor income capital, gross
Y^{lab}	Institutional income (labor)
Y^{ent}	Institutional income (enterprises)
Y^{H}	Household income
$TARIFF$	Tariff revenue
$INDTAX$	Total indirect tax revenue
$INDSUB$	Total indirect subsidies
$NETSUB$	Total export subsidies
$WTAX$	Total wage taxes (incl. social security)
$ENTTAX$	Total enterprise tax revenues
$TOTHHTAX$	Total household tax revenues
DEP	Total depreciation
P_i^K	Price of a unit of capital in each sector
$ENTSAV$	Total enterprise savings
$HHSAV$	Total household savings
GR	Total government revenue
$SAVINGS$	Total savings
$GOVSAV$	Government savings (Net lending)
$FSAV$	Net foreign savings (current account)

Exogenous

$ENTSUB$	Government transfers to enterprises
$GPROF$	Distributed profits to government
HHT	Government transfer payments to households
$REMIT$	Net remittances to households from abroad
t_i^E	Export subsidy rates
t_i^W	Wage tax rates
t^{ent}	Tax rate enterprises
t^H	Household income tax rates
$depr_i$	Deprecitation rates
$ents$	Enterprise saving rate
mps	Household saving rate
$FBOR$	Net foreign government borrowing

Final Demand

Endogenous

C_i	Final demand for private consumption
G_i	Final demand for government consumption
DST_i	Inventory investment by sector
$INVEST$	Total investment (incl. inventory investment)
DK_j	Fixed investment by sector of destination
$TOTINV$	Total capital investment (in real terms)
ID_i	Final demand for productive investment

Exogenous

β_i^H	Household consumption shares
β_i^G	Government consumption shares
$GDTOT$	Aggregate government expenditure on goods and services
$dstr_i$	Ratio of inventory investment to domestic output
$FXDINV$	Fixed capital investment
$kish_i$	Shares of investment by sector of destination
b_{ij}	Capital composition matrix

Market Clearing

Exogenous

L^S	Labor supply
K^S	Capital supply

Eigentümer, Herausgeber und Verleger: Gemeinnütziger Verein "Österreichisches Institut für Wirtschaftsforschung", Wien 3, Arsenal, Objekt 20. Postanschrift: A-1103 Wien, Postfach 91. Tel. (1) 798 26 01-0, Fax (1) 798 93 86. Vorstand: Präsident: Ing. Leopold Maderthaner, Vizepräsidenten: Eleonora Hostasch, Univ.-Prof. Dr. Erich Streißler, Geschäftsführer: Prof. Dr. Helmut Kramer.

Satz und Druck: Österreichisches Institut für Wirtschaftsforschung.

Verkaufspreis: S 100,–.